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Yusu et al.

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(54) **MAGNETIC RECORDING APPARATUS**

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(\*) **Notice:** Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

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(58) **Field of Search** ..... 428/694 B, 694 BA, 428/900, 336, 332

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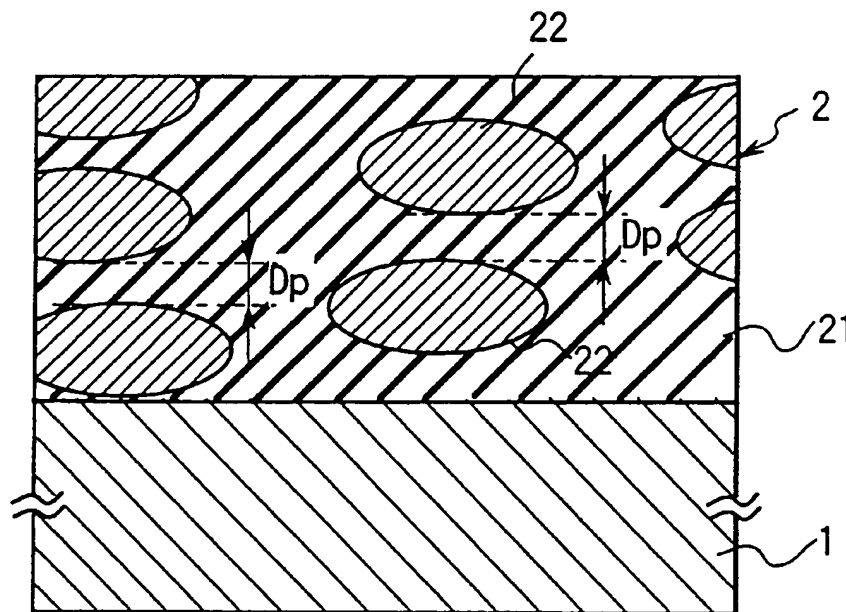
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(57) **ABSTRACT**

A magnetic recording apparatus includes a magnetic recording medium including a substrate and a magnetic recording layer formed on the substrate and having a structure in which magnetic grains are dispersed in a nonmagnetic matrix, a means for recording magnetic information on the magnetic recording medium, and a means for reproducing magnetic information from the magnetic recording medium wherein the magnetic grains are separated from the substrate by a part of the matrix and form a substantially single layer parallel to the main surface of the substrate.

**23 Claims, 11 Drawing Sheets**



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angle (represented by  $\phi$  in FIG. 10) the side surface of the magnetic grain 22a makes with the surface of the substrate is 75.degree. or less. This angle is only the average value, and its maximum value may be about 85.degree.. This angle is preferably 30.degree. to 70.degree., and more preferably 45 to 70.degree..

(34) To grow the island-like magnetic grain 22a like the one shown in FIG. 10, it is effective to form an underlayer 3 having a specific crystal orientation. A material preferable for forming such a crystalline underlayer includes Cr, V, Ti, Pt, Pd, Ir, and ZnO. The underlayer may be amorphous as long as it has surface energy suitable for growing an island-like magnetic grain. A material preferable for forming such an amorphous **underlayer includes CoZrNb, NiNb, Sb, Ge, and C.** If an underlayer made of one of these materials is formed to have a thickness of 200 nm or less on an arbitrary substrate, island-like magnetic grains can be easily grown. If no underlayer is disposed, island-like magnetic grains can be grown on the substrate by optimizing the deposition conditions.

(35) The magnetic recording layer 2 may contain not only island-like magnetic grains having an inclined surface with respect to the substrate, but also flat magnetic grains separated from the island-like magnetic grains